THE DIGITAL EARTH: WHY NOT?

By Daniel Cassard, Sergei Cherkasov & Francois Robida.

In the last decades, informational revolution provided facilities pushing multiple scientific groups for creating digital models of our planet. Diversities of these attempts make us intended to review the up-to-date state of the problem.

All the models in work are being presented by databases that can be divided on local and distributed, technically speaking, and, on the other hand, on specialized and pretending on universality, in terms of their content.

Local spatial databases are more or less customary in comparison with the distributed ones, and we can name, among specialized local databases, such successful projects as gelolgical and geophysical databases created in Cornell University (Ithaca, NY, USA, http://atlas.geo.cornell.edu/webmap/) and in NOAA, USA (http://www.ngdc.noaa.gov/). The Geodynamic Globe developed in Vernadsky SGM RAS makes a good geological-geophysical compilation of 1:10,000,000 scale for the whole world. In Japan, in 1996, the Earth Simulator project had been started, and it can a great success after putting into operation the most powerful in the world computing cluster of the same name. The main goal of the Japanese project is declared as prognosis for global changes, and relates, mainly, with climatic issues.

At the moment, ESRI is, undoubtedly, the leader among groups working on local spatial databases. The ArcAtlas “Our Earth” contains more than 40 thematic layers and is being widely used for different purposes around the world. Nearly all mapping projects of 1:10,000,000 and less detailed scale use geographic layers of the ArcAtlas.

After viewing successful local projects, we can see completely different story when we go to the distributed spatial databases. Such databases are being created as for data proper, so for metadata. Among the latter we can mention the database developed in the University of Iowa State (http://www.cgrer.uiowa.edu/servers/servers_geodata.html#directory), which is one of the most often being updated metadata databases, and contains hundreds of references on commercial and open sources. Many other examples can be easily found in the Internet.

One of the earliest distributed spatial databases is World Data Center System – WDC (http://clust1.wdcb.ru/) under International Council of Scientific Unions. First such data centers had appeared in China, in 1988. Today, many of the centers are in operation, but the system itself is not well organized, and looks rather as a distributed bank of different data without proper interface, not as database in modern meaning of the term.

We should mention, also, may be, the most amusing project of the kind, The Digital Earth, (http://www.digitalearth.gov/). The project was proposed by USA Vice-president Gore in 1998, the head agency is NASA. Among participants of the project we can see many of USA governmental agencies, universities, and private organizations; Canada, China, European Union, and Israel. Coordination of the work is being executed by Digital Earth Steering Committee - DESC, Interagency Digital Earth Workgroup - IDEW, and Digital Earth Community Meeting - DECM).

A similar project named “Terre Virtuelle” is announced by the French Geological Survey (BRGM), and it is the only notable project emphasized on geological content.

All the projects of distributed spatial databases face serious difficulties related with problems of metadata standards, interoperability, and psychological problems, which is, probably, the most important barrier on the way. Things are a bit easier when we go for geophysical databases, as far as here we deal with digits attached to coordinates. But, when we go for geology, different institutions use, for example, different concepts of work, and, consequently, different ways of data interpretation. It is quite difficult to combine, or even to consider together, the results of different interpretations. At the same time, for any institution, to overcome the way of work, to which the institution is adjusted, is also a problem.

Thus, we know, that we do have a hardware and software allowing us to create, practically, as detailed Earth’s model, as we want, but, it is nearly impossible to do that in terms of standards, interoperability, compatibility of interpretations, and, at the end of the day, management and psychological barriers.

It is possible, that the problem raised at the state level (such as “Digital Earth”), still have some chances to succeed. Also possible is the use of some hierarchical multidisciplinary structure, such as Russian Academy of Sciences. But, up to date, the problem is still open.